



A Study into the use of Programmable Logic Controllers for control of lighting and heating within the home

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1. Introduction

Home automation, also referred to as domotics or smart homes, is a system of devices that allow a central control system to automatically control household devices, such as lighting and heating, from an automatic input, or manual control from a central controller. This project focuses on incorporating a PLC to control lighting and heating within the home.

2. Aims & Objectives

The aim of this project is to create a control system that automates the control of lighting and heating within the home to ensure maximum efficiency and minimal energy usage. The objectives to be met are,

- Produce project plan
- Research existing systems
- Produce diagrams to aid project development
- Develop systems to produce a working model
- Monitor results in comparison to traditional control methods
- Evaluate and conclude results
- Produce recommendations for future projects

3. Research overview

The research for this project initially consisted of researching early concepts of home automation, this started with 'quick switch' technology, invented by John Henry Holmes in 1884 which is the light switch everyone uses today. The research then focused on modern concepts of smart homes. There are primarily 3 types of systems,

- Powerline home automation
- Wired home automation system
- Wireless home automation system

The findings of this research aided with the design and implementation of the project. Positive and negatives discovered during the research period helped in the decisions made for the design

4. Design & Implementation

The final design uses PIR occupancy sensors to provide a digital input signal to the PLC, a lux level sensor to indicate light level and a temperature sensor (RTD) to indicate the temperature. Outputs are energized/ de-energized if the occupancy sensor is set/ unset and the corresponding analogue signals are below or above the required set points.



5. Analysis

Testing was completed by using the project build alongside the lighting and heating in the home. Usage of lighting and heating was recorded over a 24 hour period for the system that is currently installed, the usage was then recorded by the project control panel.

Area of house	Total times (mins) Existing	Total times (mins) Project	% difference
Living room	300	115	-61.67%
Bedroom 1	110	45	-59.09%
Toy room	110	35	-68.18%
Bathroom 1	130	90	-30.77%
Kitchen	365	120	-67.12%
Bedroom 2	230	115	-50.00%
Bedroom 3	10	15	50.00%
Bathroom 2	75	65	-13.33%
Outside	780	45	-94.23%
Hallway	680	175	-74.26%

Lighting use comparison

Area of house	Total times (mins) Existing	Total times (mins) Project	% difference
Living room	240	235	-2.08%
Bedroom 1	165	95	-42.42%
Toy room	175	110	-37.14%
Bathroom 1	195	140	-28.21%
Kitchen	195	200	2.56%
Bedroom 2	255	150	-41.18%
Bedroom 3	210	135	-35.71%
Bathroom 2	225	145	-35.56%
Hallway	250	135	-46.00%

Heating use comparison

6. Conclusion

The overall project was a success. This conclusion is supported by the potential energy saving opportunities displayed in the analysis. The aims and objectives were met. The main area of improvement would have been to have incorporated the project into the home wiring system. Future development opportunities would be to install an energy monitor in the control panel, have a battery backup system incorporated and to have the system online to enable remote access.